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Patent Claims

- 5 1. A belt tensioning unit of a seat belt (1), which  
can be retracted on a belt reel (4), for an occupant on  
a seat in a vehicle, in particular motor vehicle, with
- a return device (6), which is connected in terms  
10 of drive to the belt reel, for the automatic  
shortening of the belt,
  - an extension lock (5) of the belt, which extension  
lock is effective at predetermined parameters, in  
particular at a predetermined deceleration or  
15 acceleration of the vehicle or of its body and/or  
when a predetermined extension speed of the belt  
is exceeded,
  - a sensor system which is capable of recognizing  
potentially dangerous and/or accident-prone  
driving situations, and
  - 20 - a reversible clamping device (8), which interacts  
with the sensor system and can be driven by means  
of an associated motor (9), the motor (9) of which  
clamping device drives the belt reel (4) in the  
clamping direction of the belt as a function of  
25 signals of the sensor system and sets an increased  
belt tension, characterized in that a two-path  
transmission (10) is arranged between the motor  
(9) of the reversible clamping device (8) and the  
belt reel (4), the paths of which transmission  
30 have different transmission ratios with  
correspondingly different intensification of the  
torque on the belt reel in comparison to the motor  
torque.
- 35 2. The belt tensioning unit as claimed in claim 1,  
characterized in that the two-path transmission can be  
switched over by reversing the direction of rotation of  
the motor (9), and the belt reel (4) rotates relative

to the motor in one direction of rotation when the one path is switched on and in the opposite direction of rotation when the other path is switched on.

- 5     3.     The belt tensioning unit as claimed in claim 2, characterized in that the paths can be switched on by two freewheels (15, 17; 23, 26), of which the one locks in the one direction of rotation and the other locks in the other direction of rotation of the motor.
- 10     4.     The belt tensioning unit as claimed in claim 3, characterized in that the two-path transmission is designed as a planetary transmission.
- 15     5.     The belt tensioning unit as claimed in claim 4, characterized in that the first freewheel (15) is arranged between a stationary part (16) and the planet carrier (14) of the planetary transmission.
- 20     6.     The belt tensioning unit as claimed in claim 4 or 5, characterized in that the second freewheel (17) is arranged between planet carrier (14) and sun wheel (12) of the planetary transmission.
- 25     7.     The belt tensioning unit as claimed in claim 3, characterized in that the transmission is designed as a cylindrical transmission with paths arranged in two radial planes at a distance from each other axially.
- 30     8.     The belt tensioning unit as claimed in claim 7, characterized in that the first freewheel (23) is arranged in one radial plane between motor shaft (20) and a gearwheel (22) arranged thereon.
- 35     9.     The belting tensioning unit as claimed in claim 7 or 8, characterized in that the second freewheel (26) is arranged in the other radial plane between motor shaft (20) and a gearwheel (25) arranged thereon.

10. The belt tensioning unit as claimed in one of claims 2 to 9, characterized in that there is a rotational clearance between a motor-side part of the input of the transmission (10) and the transmission  
5 output, and in that a slipping clutch (30', 30'') is arranged between input and output, via which slipping clutch the transmission output can be driven within the abovementioned clearance in the forward or backward direction depending in each case on the direction of  
10 rotation of the transmission input.

11. The belt tensioning unit as claimed in claim 1, characterized in that between input and output of the two-path transmission (10) there is firstly arranged a  
15 direct frictional connection (37) and secondly an interlocking drive train (35, 39, 40, 41), which is stepped down in comparison to the frictional connection and, when the output moves in a direction of movement associated with the clamping direction of the belt reel  
20 (4), is free from inevitably being coupled in the direction of the input.

12. The belt tensioning unit as claimed in claim 11, characterized in that the interlocking drive train is  
25 designed to be self-locking in relation to the transmission of force from the output to the input.

13. The belt tensioning unit as claimed in claim 12, characterized in that, in the interlocking drive train,  
30 an input worm (40) interacts with an output worm wheel (41).

14. The belt tensioning unit as claimed in one of claims 11 to 13, characterized in that the direct  
35 frictional connection is designed as a slipping clutch (37).

15. The belt tensioning unit as claimed in one of  
claims 10 to 14, characterized in that a clutch (31) is  
arranged between transmission output and belt reel (4),  
said clutch opening and closing as a function of the  
5 direction of rotation of its transmission side.

16. The belt tensioning unit as claimed in one of  
claims 1 to 14, characterized in that a clutch (31)  
which can be actuated by external power, in particular  
10 electrically, is arranged between transmission output  
and belt reel (4).